

# **EXHIBIT B**

## DECLARATION OF AMIR MOHEB MOHAREB, M.D.

I, Amir Mohareb, hereby declare the following under penalty of perjury pursuant to 28 U.S.C. § 1746:

I am an Infectious Diseases physician in Massachusetts. I completed my medical degree in Johns Hopkins University School of Medicine, my training in Internal Medicine at Yale-New Haven Hospital, and my Infectious Diseases fellowship in the joint program of Brigham & Women's Hospital and Massachusetts General Hospital. I am board-certified in both Internal Medicine and Infectious Diseases. I practice in Massachusetts General Hospital and am an Instructor in Harvard Medical School. I am a member of the Biothreats Response Team at Massachusetts General Hospital, a position which has required me to take a leading role in infection control measures during the 2019 Coronavirus Disease (COVID-19) outbreak.

I have been retained by the plaintiffs in this case to provide statements and testimony about COVID-19, its clinical presentation and course, and the medical evidence regarding its transmission. I am not charging the plaintiffs for the time that I spend on this case. A copy of the documents I received as part of my work on this case is appended to the end of my report. My opinions are set forth to a reasonable degree of medical certainty based on my education, training, experience, and familiarity with the authoritative literature on the subjects discussed below.

**COVID-19 Background.** COVID-19 is the disease caused by a novel respiratory virus, SARS-CoV-2, identified in late 2019 in Wuhan, China.<sup>1</sup> The name of the virus is SARS-CoV-2, and the name of the disease caused by this virus is COVID-19. This disease primarily manifests as influenza-like illness. A fraction of patients with COVID-19 in all age groups go on to develop severe respiratory disease. A patient with the severe form of COVID-19 is unable to breathe effectively to provide enough oxygen for their body's vital organs ("hypoxia"). Hypoxia causes organ failure and will lead to death if it progresses. Patients with hypoxia from severe COVID-19 uniformly feel an intense and frightening degree of shortness of breath. Medical treatment for hypoxia involves provision of supplemental oxygen, which can be done non-invasively in mild cases and by ventilator in severe cases. In the United States, these patients remain connected to the ventilator for a median of 10 days.<sup>2</sup> The mortality rate is highest among those of advanced age and those with other medical conditions. Of those who recover to the point of being liberated from mechanical ventilation, these patients commonly need several more days of hospitalization and then weeks of rehabilitation. Aside from hypoxia, COVID-19 has been observed to cause several other complications in hospitalized patients, including blood clots, strokes, liver damage, kidney damage, irregular heart rhythms, and heart failure. Hospitalized patients with COVID-19 are also

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<sup>1</sup> Wei-jie Guan et al., "Clinical Characteristics of Coronavirus Disease 2019 in China," *New England Journal of Medicine*, February 28, 2020, <https://doi.org/10.1056/NEJMoa2002032>.

<sup>2</sup> Pavan K. Bhatraju et al., "Covid-19 in Critically Ill Patients in the Seattle Region — Case Series," *New England Journal of Medicine*, March 30, 2020, <https://doi.org/10.1056/NEJMoa2004500>.

at risk of superimposed bacterial infections, such as pneumonia and bloodstream infections.

SARS-CoV-2 is spread easily between humans. There is no effective therapy. There is no effective intervention to prevent disease in a person exposed to someone with COVID-19. There is no effective vaccine or medication that prevents COVID-19. Therefore, the only effective means of addressing the threat of COVID-19 are in behavioral strategies of prevention. Persons who have COVID-19 must be immediately isolated to prevent transmission to others. Persons who are exposed to COVID-19 must be immediately quarantined. Persons who are susceptible to COVID-19 must maintain social distancing from others.

**Diagnosis.** The most common means of confirming COVID-19 diagnosis is through detection of SARS-CoV-2 by nasopharyngeal testing. In this test, a swab of the nasopharynx of the patient is obtained and a molecular identification of the SARS-CoV-2 virus is conducted using a method called polymerase chain reaction (PCR). Concerns have been raised about the sensitivity of the nasopharyngeal SARS-CoV-2 PCR, meaning that a number of patients suspected of having COVID-19 may indeed have the infection despite a negative nasopharyngeal SARS-CoV-2 PCR test.<sup>3</sup> The sensitivity of nasopharyngeal testing by all commercial testing platforms declines several days after the onset of symptoms, even though patients may still have clinical illness and may still be able to transmit the virus. Because of this, many clinical settings use two serial negative tests to “rule out” patients for the virus. The Abbott “ID Now” SARS-CoV-2 test is one type of PCR test, which can deliver rapid results, but has a particularly high false negative rate. In patients with a compatible clinical syndrome, I would not rely on a negative PCR test from the Abbott “ID Now” SARS-CoV-2 test. Indeed, in my hospital, patients with typical clinical signs and symptoms of COVID-19 who are at epidemiological risk for the infection (such as from an exposure to a jail) are presumed to have COVID-19 even if they have two negative SARS-CoV-2 nasopharyngeal PCR tests. I did not see any indication in the materials that I reviewed that individuals at Cook County Jail receive two negative tests before COVID-19 is considered ruled out or that individuals with compatible clinical syndromes are presumed to have COVID-19 despite negative PCR testing. This suggests to me that some people in Cook County Jail who initially test negative may in fact have COVID-19.

**Transmission.** Based on a framework followed by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), there are three possible ways that a respiratory virus can potentially spread:<sup>4</sup>

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<sup>3</sup> J Zhao et al., “Antibody Responses to SARS-CoV-2 in Patients of Novel Coronavirus Disease 2019,” *Clinical Infectious Diseases*, March 28, 2020, <https://doi.org/10.1093/cid/ciaa344>; Li Guo et al., “Profiling Early Humoral Response to Diagnose Novel Coronavirus Disease (COVID-19),” *Clinical Infectious Diseases*, March 21, 2020, <https://doi.org/10.1093/cid/ciaa310>; Tao Ai et al., “Correlation of Chest CT and RT-PCR Testing in Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases,” *Radiology*, February 26, 2020, 200642, <https://doi.org/10.1148/radiol.2020200642>.

<sup>4</sup> Chad J. Roy and Donald K. Milton, “Airborne Transmission of Communicable Infection — The Elusive Pathway,” *New England Journal of Medicine* 350, no. 17 (April 22, 2004): 1710–12, <https://doi.org/10.1056/NEJMp048051>.

1. Fomite transmission: virus particles remain viable on environmental surfaces. When people touch these surfaces and then touch their face, they can contract the virus.
2. Droplet transmission: virus particles in large respiratory droplets ( $\geq 5$  micrometres) that are emitted by an infected person can be inhaled by a susceptible person in close contact. These large droplets can travel up to six feet. Healthcare workers protect themselves against droplet transmission by wearing "routine" surgical or procedural masks, gowns, and gloves, and practicing hand hygiene before and after each patient encounter.
3. Airborne, or aerosolized, transmission: virus particles in small respiratory droplets ( $< 5$  micrometres) that are emitted by an infected person can remain suspended in the air and remain infective over several hours and over long distances. Pathogens that travel via airborne transmission can infect persons even if they are wearing surgical or procedural masks. Healthcare workers protect themselves against airborne transmission by wearing specialized masks (N95 masks or Powered Air-Purifying Respirators) and by isolating infected persons in closed rooms with negative-pressure ventilation. Buildings or facilities with other forms of ventilation may spread aerosolized pathogens between rooms.

It is well-known that SARS-CoV-2 is spread by fomite and droplet transmission. Researchers in the National Institute of Allergy and Infectious Diseases recently sought to determine whether SARS-CoV-2 can remain viable via airborne transmission.<sup>5</sup> They aerosolized virus in small droplets ( $< 5$  micrometres) at quantities that would be typically found from the respiratory tract of infected humans. They then spread the virus across different environmental conditions. They found that SARS-CoV-2 virus remained viable in aerosols (small droplets) for the entire duration of their experiment (3 hours). SARS-CoV-2 also remained viable on various surfaces (e.g., plastic and stainless steel) for up to 72 hours. This leads medical experts to conclude that SARS-CoV-2 is predominantly transmitted by fomite and droplet transmission, but airborne transmission is possible when aerosols are generated.

This is consistent with clinical experience with SARS-CoV-1, a closely related virus that was the cause of the 2003 SARS outbreak in China, Hong Kong, and Canada. While the dominant form of transmission was through fomites and droplets, SARS-CoV-1 was also capable of being aerosolized and remained infective over time and space via airborne transmission. This virus was transmitted to several healthcare workers via droplet transmission. During the course of aerosol-generating medical procedures, SARS-CoV-1 was transmitted to healthcare workers via airborne transmission even if they were wearing surgical masks.<sup>6</sup> Aerosols can be generated by a number of common

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<sup>5</sup> Neeltje van Doremalen et al., "Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1," *New England Journal of Medicine* 382, no. 16 (April 16, 2020): 1564–67, <https://doi.org/10.1056/NEJMc2004973>.

<sup>6</sup> Damon C. Scales et al., "Illness in Intensive Care Staff after Brief Exposure to Severe Acute Respiratory Syndrome," *Emerging Infectious Diseases* 9, no. 10 (October 2003): 1205–10, <https://doi.org/10.3201/eid0910.030525>; Yee-Chun Chen et al., "SARS in Hospital Emergency Room," *Emerging Infectious Diseases* 10, no. 5 (May 2004): 782–88, <https://doi.org/10.3201/eid1005.030579>.

events, including vigorous coughing, sneezing, use of certain nasal sprays or nebulizer treatments, and toilet flushing.

In addition to respiratory secretions, SARS-CoV-2 virus has been isolated in secretions of the mouth, nose, eyes, blood, stool, and urine. This suggests that respiratory contact is not the only mode of transmission for this virus. There are several reasons to believe that SARS-CoV-2 can be transmitted via fecal-oral contact.<sup>7</sup> First, many viral respiratory infections, including other coronaviruses closely related to SARS-CoV-2, have been shown to also transmit via fecal-oral contact. Second, SARS-CoV-2 has been identified in the stool of many patients with COVID-19.<sup>8</sup> Third, many patients with COVID-19 have nausea, vomiting, and diarrhea, suggesting that the virus has a direct pathogenic effect on the gastrointestinal tract. Finally, even among COVID-19 patients who lack gastrointestinal symptoms, live virus has been isolated in the stool. The identification of viable SARS-CoV-2 in stool of infected persons raises concern of airborne transmission via toilet flushing.<sup>9</sup>

By these mechanisms, SARS-CoV-2 is easily transmitted between humans. There is overwhelming evidence demonstrating that a person can spread SARS-CoV-2 before they develop symptoms or without ever developing symptoms at all.<sup>10</sup> This characteristic is one of the major reasons why it spreads so rapidly. At the time of this writing, there have been more than 700,000 laboratory-confirmed cases of COVID-19 in the U.S. with more than 30,000 deaths. Because of widespread restrictions in laboratory testing, I believe there are many more infected persons in the U.S. than have been confirmed. Rapid transmission of the virus has been noted in congregate settings, including nursing homes, cruise ships, conferences, homeless shelters, and correctional facilities. In many of these settings, infection spread despite the diligent implementation of hygienic measures, including physical separation of individuals within the congregate setting and the use of hand hygiene and personal protective equipment.

In his declaration, Mr. Michael Miller states that when individuals are identified as being symptomatic, they are put into isolation at the Cook County Jail. While this intervention is necessary, it is insufficient to prevent spread of the infection because patients transmit SARS-CoV-2 prior to developing symptoms. It further appears from the materials that I reviewed that the jail is housing persons under investigation (PUIs) of

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<sup>7</sup> Jinyang Gu, Bing Han, and Jian Wang, "COVID-19: Gastrointestinal Manifestations and Potential Fecal–Oral Transmission," *Gastroenterology*, March 2020, <https://doi.org/10.1053/j.gastro.2020.02.054>.

<sup>8</sup> Wenling Wang et al., "Detection of SARS-CoV-2 in Different Types of Clinical Specimens," *JAMA*, March 11, 2020, <https://doi.org/10.1001/jama.2020.3786>.

<sup>9</sup> Sunny H Wong, Rashid NS Lui, and Joseph JY Sung, "Covid-19 and the Digestive System," *Journal of Gastroenterology and Hepatology*, March 25, 2020, <https://doi.org/10.1111/jgh.15047>.

<sup>10</sup> Yan Bai et al., "Presumed Asymptomatic Carrier Transmission of COVID-19," *JAMA* 323, no. 14 (April 14, 2020): 1406, <https://doi.org/10.1001/jama.2020.2565>; Kenji Mizumoto et al., "Estimating the Asymptomatic Proportion of Coronavirus Disease 2019 (COVID-19) Cases on Board the Diamond Princess Cruise Ship, Yokohama, Japan, 2020," *Euro Surveillance: Bulletin Europeen Sur Les Maladies Transmissibles = European Communicable Disease Bulletin* 25, no. 10 (2020), <https://doi.org/10.2807/1560-7917.ES.2020.25.10.2000180>; Hiroshi Nishiura et al., "Estimation of the Asymptomatic Ratio of Novel Coronavirus Infections (COVID-19)," *International Journal of Infectious Diseases*, March 2020, <https://doi.org/10.1016/j.ijid.2020.03.020>.

having COVID-19 in isolation together while their tests are pending. If this occurs, it represents a grave health risk because it is almost certain to mix positive and negative cases together, thereby increasing the risk that PUIs who were negative before being put into isolation will develop COVID-19.

Hand hygiene and the provision of surgical masks are insufficient to prevent the spread of infection in a congregate setting. A clear demonstration of this is evident in the case of the Diamond Princess cruise ship,<sup>11</sup> which sailed from Japan in January of this year. In the last week of January, a passenger who disembarked from this ship in Hong Kong tested positive for COVID-19. Within days, the cruise ship was quarantined in Japan and strict precautions of hand hygiene and cabin isolation were implemented for all crew and passengers. Despite these measures, more than 700 people were infected with the virus over the following month. By the end of February, the Diamond Princess cruise ship accounted for nearly half of COVID-19 cases outside of China. Several other cruise ships have since had similar experiences with COVID-19. In terms of viral transmission dynamics, in my opinion, a jail constitutes an equal or greater risk setting to that of a cruise ship.

**Social Distancing.** The recommendation for all persons living in areas of COVID-19 disease activity is to engage in social distancing, hand hygiene, and proper respiratory precautions. Social distancing involves physical separation of individuals by more than six feet, avoidance of public places, and avoidance of congregate habitation. Social distancing is the primary means by which individuals can be safely protected from the threat of COVID-19, and by which public healthcare facilities will be able to withstand the surge in patient volume related to this outbreak. There is ample evidence supporting the use of social distancing as the primary measure of prevention in the COVID-19 outbreak:

- There is a strong biological rationale to containing a respiratory viral illness when susceptible populations stop gathering around persons who are potentially infected.
- When social distancing measures have been implemented in prior outbreaks of respiratory viruses, they have demonstrated moderate success in containing the spread of infection.
- Mathematical modeling studies project that social distancing measures prevent a rapid, overwhelming epidemic of COVID-19 cases.
- Analyses of state-level policies in Hong Kong and in the United States during the COVID-19 outbreak demonstrate that implementation of social distancing measures coincide with a reduced spread of the infection.<sup>12</sup>

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<sup>11</sup> Mallapaty, Smriti. "What the Cruise-Ship Outbreaks Reveal about COVID-19," Nature News. accessed April 18, 2020, <https://www.nature.com/articles/d41586-020-00885-w>.

<sup>12</sup> Benjamin J Cowling et al., "Impact Assessment of Non-Pharmaceutical Interventions against Coronavirus Disease 2019 and Influenza in Hong Kong: An Observational Study," *The Lancet Public Health*, April 2020, [https://doi.org/10.1016/S2468-2667\(20\)30090-6](https://doi.org/10.1016/S2468-2667(20)30090-6).

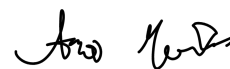


Social distancing has been recommended by the CDC, the WHO, the Infectious Diseases Society of America, and numerous other professional organizations and public health entities in response to this outbreak. Social distancing is the officially stated policy of state and federal governments in response to COVID-19. Without social distancing, medical experience demonstrates that the rate of transmission will be rampant and uncontrolled, and will risk overwhelming the healthcare system.

I reviewed the materials from the Sheriff suggesting that the provision of surgical masks alleviates the need for social distancing. This is inconsistent with the position of the CDC, the WHO, and a number of professional and public health organizations with expertise on COVID-19. As I described above, surgical masks do not prevent fomite, airborne transmission, and fecal-oral transmission of the virus. The high rate of infectivity by asymptomatic or mildly symptomatic persons, in concert with the limitations of clinical assessment and PCR testing in identifying positive cases, makes social distancing a necessary intervention to prevent the spread of infection and downstream complications of COVID-19.

I reviewed materials from the Sheriff indicating that the jail considers 170 detainees who have COVID-19 to be medically recovered from the disease. The term "medically recovered" is ambiguous since it can mean either (1) the alleviation of symptoms and clinical resolution of disease in an individual or (2) the inability for a person with COVID-19 to transmit the virus and infect others. The determination of when a COVID-19 patient is unable to transmit the virus and infect others is complex because of the limited data on this issue. In most settings, patients with COVID-19 are considered to be unable to transmit the infection only several days following the resolution of symptoms and with a negative nasopharyngeal SARS-CoV-2 PCR test.

I reviewed materials from the Sheriff stating that individuals who have recovered from COVID-19 have immunity to the virus. While it is hypothesized that most individuals who are infected with COVID-19 develop immunity to the virus, there are many uncertainties to this statement. Durable immunity to COVID-19 after infection has not been proven in large-scale medical studies, though it is inferred from similar coronaviruses. There are several known cases of COVID-19 patients meeting criteria for hospital discharge or discontinuation of quarantine (with stricter criteria than is stipulated in the Sheriff's documentation) who subsequently are found to have a positive nasopharyngeal PCR test.<sup>13</sup>



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<sup>13</sup> Lan Lan et al., "Positive RT-PCR Test Results in Patients Recovered From COVID-19," *JAMA*, February 27, 2020, <https://doi.org/10.1001/jama.2020.2783>.

**Materials Provided to Dr. Mohareb**

- Concetta Mennella's 4/6/2020 and 4/13/2020 Declarations
- Michael Miller's 4/6/2020 and 4/17/2020 Declarations
- Rebecca Levin's 4/6/2020 Declaration
- Defendant's 4/13/2020 Post-Ruling Report (Dkt. 51)
- Defendant's 4/17/2020 PI Response (Dkt. 62)
- Gregg Gonsalves Declaration (Exhibit G to Plaintiffs' Renewed PI Motion)
- COVID-19 Incarceration Model (Exhibit J to Plaintiffs' Renewed PI Motion)
- Sarah Grady Declaration (Exhibit D to Plaintiffs' Renewed PI Motion)
- Dr. Puisis's Declaration (Exhibit B to Plaintiffs' Complaint)